

Dispersion and deposition of fine particles in offices conditioned by ceiling-mounted personalized ventilator

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The performance of a ceiling-mounted personalized ventilator (PV) in reducing particle migration and transport between office stations was assessed. The PV nozzle was integrated with a peripheral diffuser that was able to form a canopy of conditioned air around the occupant. A numerical CFD model was developed to simulate the flow, temperature and particle concentration fields. Ultrafine particle generation in two source locations - inside and outside the microclimate region - was considered and validation against experimental measurements and published experimental data was performed. The observed particle distribution was very similar to that obtained using gaseous pollutants due to the minute size of the particles. The canopy had limited effectiveness in reducing the migration of particles from the macroclimate to the microclimate region and intake fractions of the order of 5.70×10^{-4} were achieved. However, the PV jet was more efficient and capable of maintaining an intake fraction of 3.2×10^{-4} when the particle-emitting source is in the proximity of the occupant. Besides, in addition to the good inhaled air quality achieved by the PV nozzle, the particle deposition rate on solid surfaces that are easily reached by the occupant was low when the source was placed in the microclimate. This is due to the volatility of the ultrafine particles that have very similar properties to the continuous gas phase.

Biography

Alain Makhoul holds a Diploma in Mechanical Engineering from the Lebanese University. He conducted his Master's thesis research work at the Center of Energy and Processes of the Ecole des Mines de Paris. He joined AUB in 2009 and he's currently working for a Ph.D. degree in mechanical engineering. His research interest is focused on localized air conditioning and indoor air quality. He has already published five relevant articles in peer-reviewed journals and attended several international conferences.

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